OPERATING SUMMARY

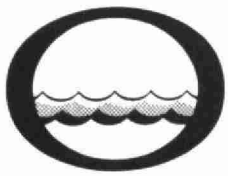
KITCHENER

water pollution control plant

1968

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations



Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 7
Ontario

We are pleased to present you with the Operating Summary for the water pollution control facilities operated for you during 1968.

Both the financial and technical information presented should be of assistance to your present and future planning in this important phase of municipal activity.

A new format has been devised to allow greater readability with equally detailed content. We trust that this will meet with your approval.

Our staff wish to express their appreciation for your co-operation throughout the year.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

KITCHENER

water pollution control plant

operated for

THE CITY OF KITCHENER

by the

ONTARIO WATER RESOURCES COMMISSION

1968 ANNUAL OPERATING SUMMARY

FOREWORD

● This operating summary outlines the project's technical capabilities and financial status in 1968. Such information mirrors past and present performance, but a major intention is to anticipate the future -- to solve problems before they occur.

The new format in which this year's data are presented is designed to offer a higher level of readability than in the past, without a corresponding decrease in compactness, accuracy and detail.

Although your Regional Operations Engineer carries the major responsibility for the contents of the report, those involved in its preparation are attached to several Commission sections and divisions. The statistics section of the Division of Plant Operations compiled the information for the graphs and charts. The draughting section of the Division of Sanitary Engineering drew the graphs. The Division of Finance provided all cost data.

Only the close co-operation of these departments allowed the publication of this summary.

CONTENTS

'68 REVIEW

A total of 3648.0 million gallons was treated at the Kitchener water pollution control plant during the year at a cost of $291,978.36. The operating cost per million gallons was $80.04 and the cost per pound of BOD removed was $0.028.

The average daily flow of 9.96 million gallons was 5.4 percent less than the 1967 average daily flow of 10.53 million gallons. The average raw sewage BOD and suspended solids concentrations were 310 mg/l and 317 mg/l respectively. The average effluent BOD and suspended solids concentrations were 20 mg/l and 21 mg/l respectively. Average BOD and suspended solids reduction efficiencies were 96.6 and 93.5 percent respectively.

The average total solids of sludge pumped to the digesters was 6.2 percent. The digestion process reduced the volatile matter by an average of 50.5 percent which compares favourably to existing operating criteria.

The vacuum filter was taken out of operation in January. Labour, chemical and haulage costs made it uneconomical to continue with the operation of the unit.

Under the supervision of head office engineers, the plant staff operated a clean, attractive and efficient plant for the City of Kitchener.

PROJECT COSTS

STAGE 1

NET CAPITAL COST (Final) Long Term Debt to OWRC	$1,312,746.07
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968	$ 530,277.00
Net Operating	$ 291,978.36
Debt Retirement	47,626.00
Reserve	10,066.35
Interest Charged	73,702.19
TOTAL	$ 423,372.90

RESERVE ACCOUNT

Balance at January 1, 1968	$ 90,938.22
Deposited by Municipality	10,066.35
Interest Earned	5,559.37
	$ 106,563.94
Less Expenditures	6,384.60
Balance at December 31, 1968	$ 100,179.34

STAGE 2

NET CAPITAL COST (Final)	$1,488,607.70
DEDUCT - Portion Financed by CMHC-MDLB (Final)	1,016,967.77
Long Term Debt to OWRC	$ 471,639.93
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968	$ 114,683.53
Net Operating	$ -
Debt Retirement	17,111.00
Reserve	9,183.95
Interest Charged	26,479.50
TOTAL	$ 52,774.45

RESERVE ACCOUNT

Balance at January 1, 1968	$ 40,134.53
Deposited by Municipality	9,183.95
Interest Earned	2,175.76
	$ 51,494.24
Less Expenditures	10,645.21
Balance at December 31, 1968	$ 40,849.03

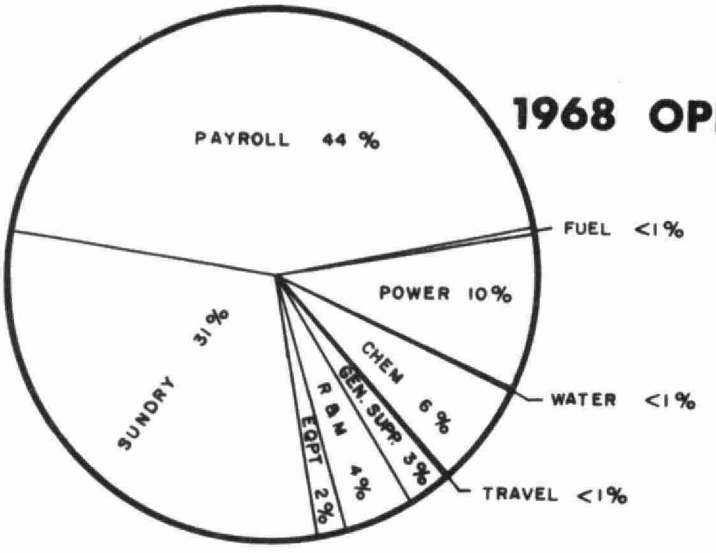
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAY ROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY	WATER	TRAVEL
JAN	12253.69	8477.88	-	-	1443.45	1054.40	371.39	79.86	788.46	38.25	-	-
FEB	18969.86	8395.17	-	-	452.79	2488.02	373.08		1881.66	5331.96	-	47.18
MAR	34725.70	13436.10	-	-	3918.11	2131.50	411.16	26.00	1461.10	13341.73	-	-
APRIL	21286.46	8828.78	88.33	-	3361.36	2131.50	564.81	75.56	1223.94	4977.60	-	34.58
MAY	20467.81	8798.50	791.47	-	2423.11	191.69	389.41	(200.00)	798.63	7121.96	99.00	54.04
JUNE	24732.82	8484.80	1704.13	-	2425.30	2131.50	804.47	2261.33	654.39	6183.74	-	83.16
JULY	20244.14	8157.49	2096.06	-	2395.33	-	1192.65	75.26	271.78	5965.35	-	90.22
AUG	27841.69	12391.48	3213.20	-	2323.58	-	1049.82	258.85	1486.56	7059.68	-	58.52
SEPT	22008.43	8242.49	1821.05	-	2449.12	2131.50	276.65	257.17	1118.70	5605.32	66.53	39.90
OCT	19946.00	8090.82	368.93	-	2314.24	-	868.90	322.51	1497.28	6455.24	-	28.08
NOV	37185.56	0219.21	121.73	-	2772.82	4435.87	836.61	365.00	140.74	19287.13	-	6.45
DEC	32316.20	16383.98	51.80	194.26	2355.58	2131.50	1365.00	1070.47	1096.23	7376.36	93.86	197.16
TOTAL	291978.36	118906.70	10256.70	194.26	28634.79	18827.48	8503.95	4592.01	12419.47	88744.32	259.39	639.29

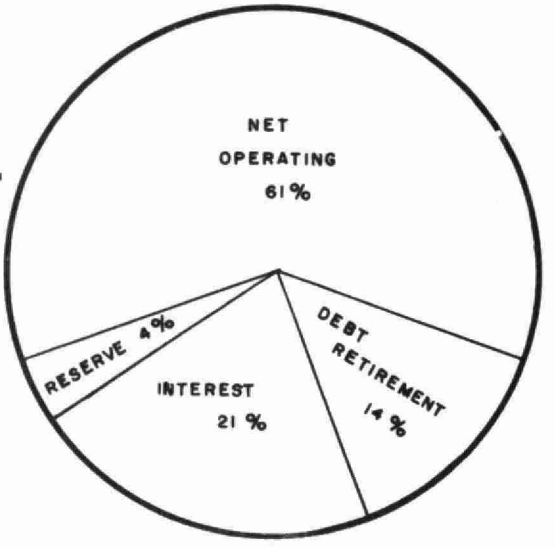
*SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $71,155.20

BRACKETS INDICATE CREDIT

1968 OPERATING COSTS



TOTAL ANNUAL COST



Yearly Operating Costs

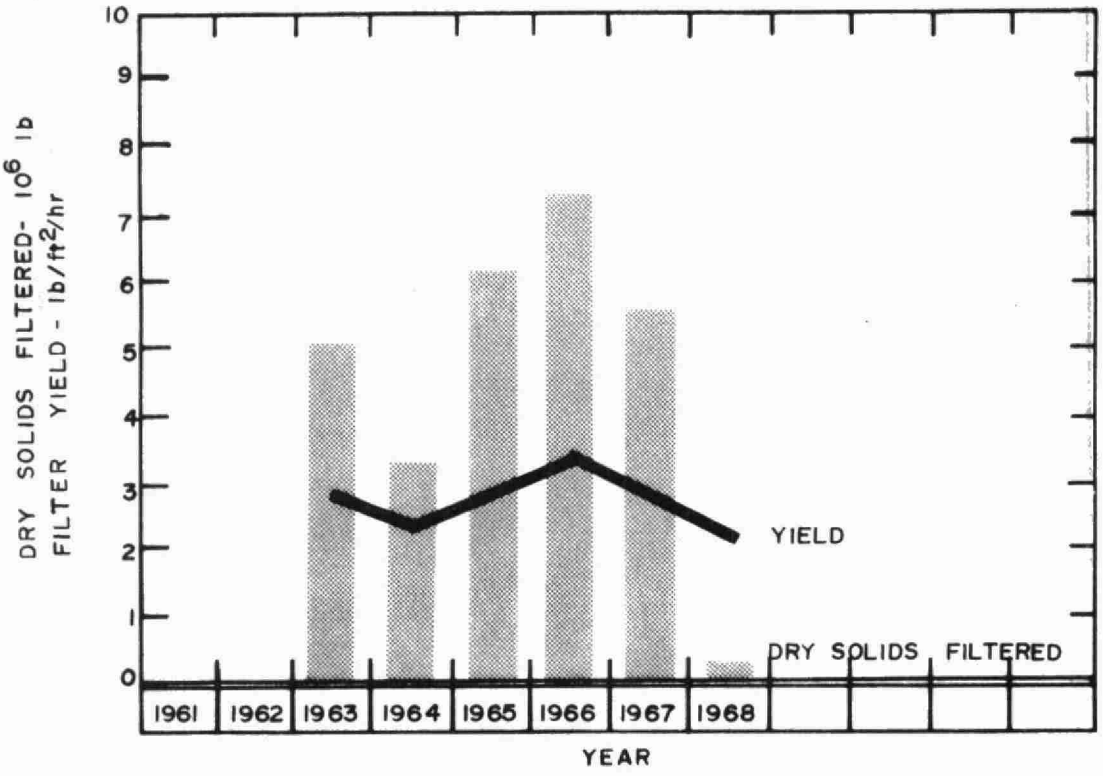
YEAR	M.G.TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1964	3026.5	$217,425.00	$71.84	1.7 cents
1965	3328.1	225,144.00	67.65	2.0 cents
1966	3457.8	279,143.00	80.73	3.6 cents
1967	3843.0	297,754.00	77.48	3.5 cents
1968	3648.0	291,978.36	80.04	2.8 cents

Process Data

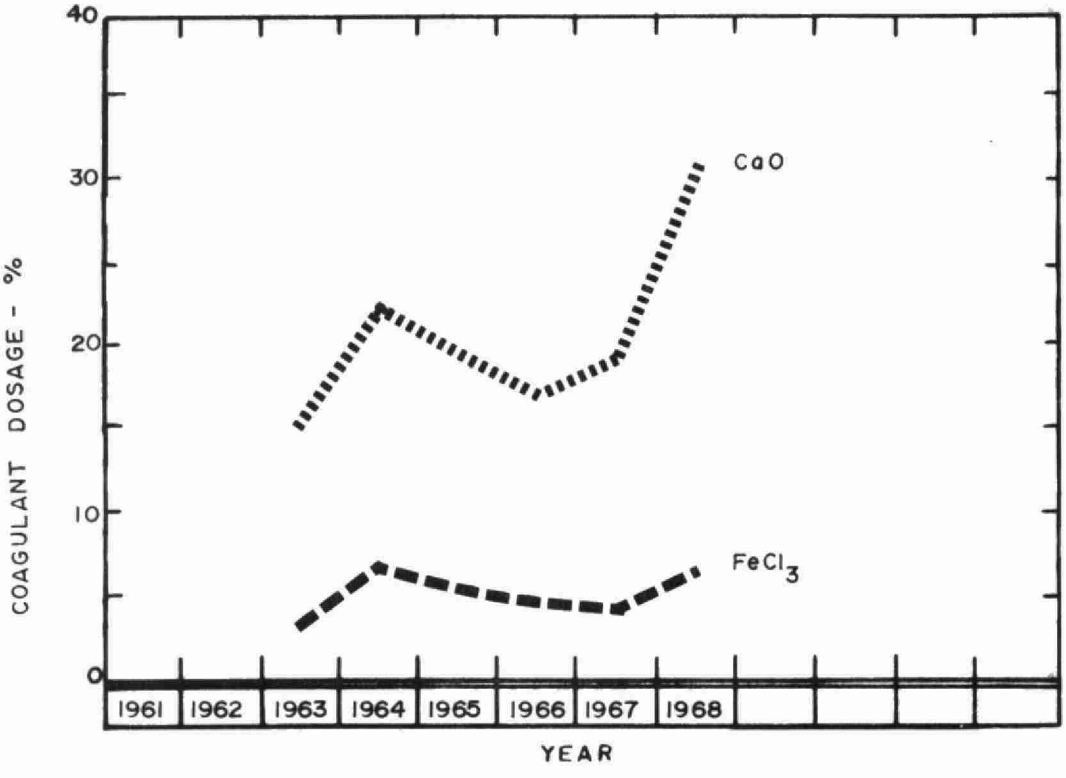
The average daily flow for the year was 9.96 million gallons, which represents a decrease of 5.4 percent as compared to the average daily flow in 1967 of 10.53 million gallons. The decrease in flow is a result of an excellent industrial waste program conducted by the City of Kitchener. The aeration section design flow of 13.5 mgd and primary section design flow of 11.5 mgd were exceeded nine and 35 percent of the time respectively.

The raw sewage BOD averaged 310 mg/l, a 29.2 percent increase over the 1967 average of 240 mg/l. The average effluent BOD was 20 mg/l. The average BOD removal efficiency was 96.6 percent.

The raw sewage suspended solids averaged 317 mg/l. This represents an 11.2 percent increase over the 1967 average of 285 mg/l. The average effluent suspended solids concentration was 21 mg/l. The average BOD removal efficiency was 93.5 percent.



VACUUM FILTRATION

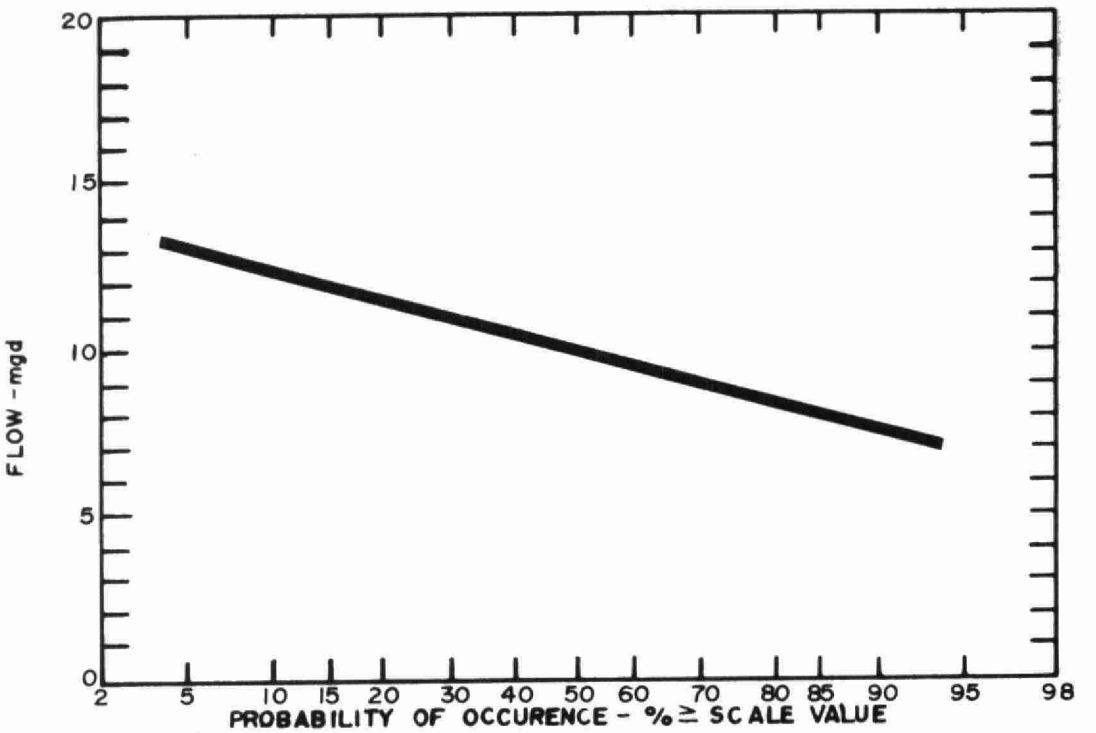


PLANT FLOWS and CHLORINATION

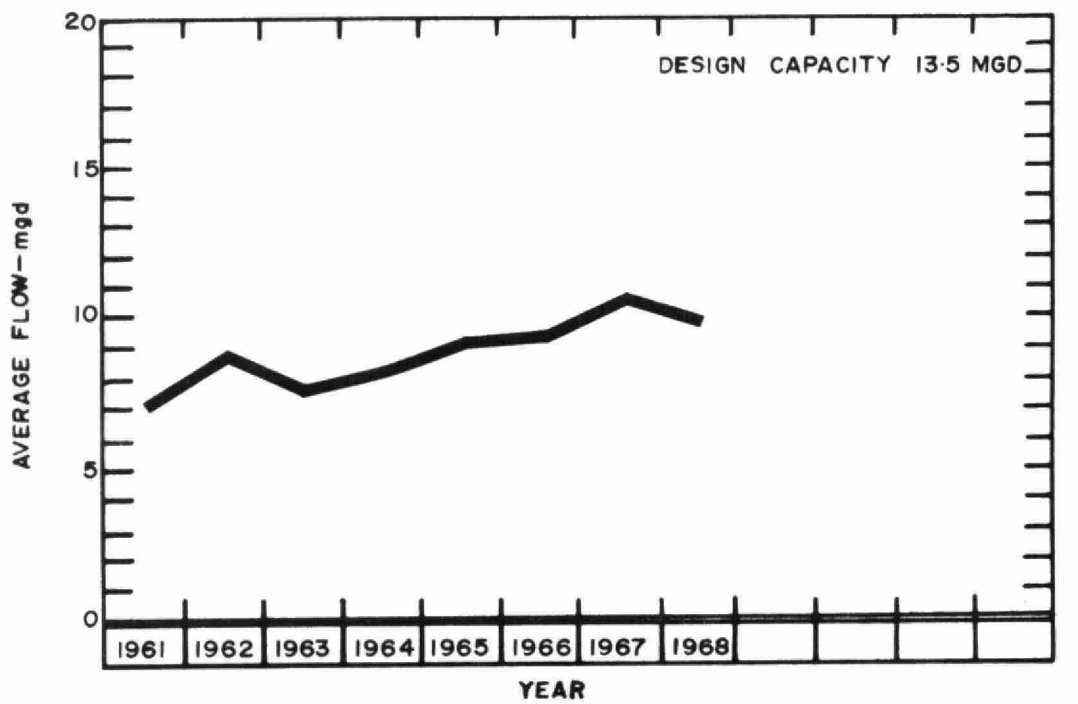
MONTH	TOTAL FLOW mg	AVERAGE DAILY FLOW mg	MAXIMUM DAILY FLOW mg	MINIMUM DAILY FLOW mg	CHLORINE USED 10^3 lbs.	DOSAGE mg/l
JAN	324.6	10.47	15.30	7.90	12.7	3.9
FEB	328.3	11.32	19.20	8.00	13.6	4.2
MAR	340.4	10.98	16.50	9.00	14.8	4.4
APR	267.0	8.90	11.80	5.70	14.0	5.2
MAY	306.6	9.89	12.70	6.10	15.6	5.1
JUN	316.1	10.54	13.86	7.04	13.8	4.4
JUL	273.5	8.82	12.40	4.40	10.9	4.0
AUG	288.3	9.30	30.00	5.16	12.3	4.3
SEPT	299.7	9.99	18.30	5.60	14.3	4.8
OCT	304.5	9.82	13.80	6.20	20.4	6.7
NOV	294.2	9.80	15.20	6.30	17.4	5.9
DEC	304.8	9.83	15.60	5.50	16.1	5.3
TOTAL	3648.0	-	-	-	175.9	-
AVERAGE	-	9.96	-	-	14.7	4.8

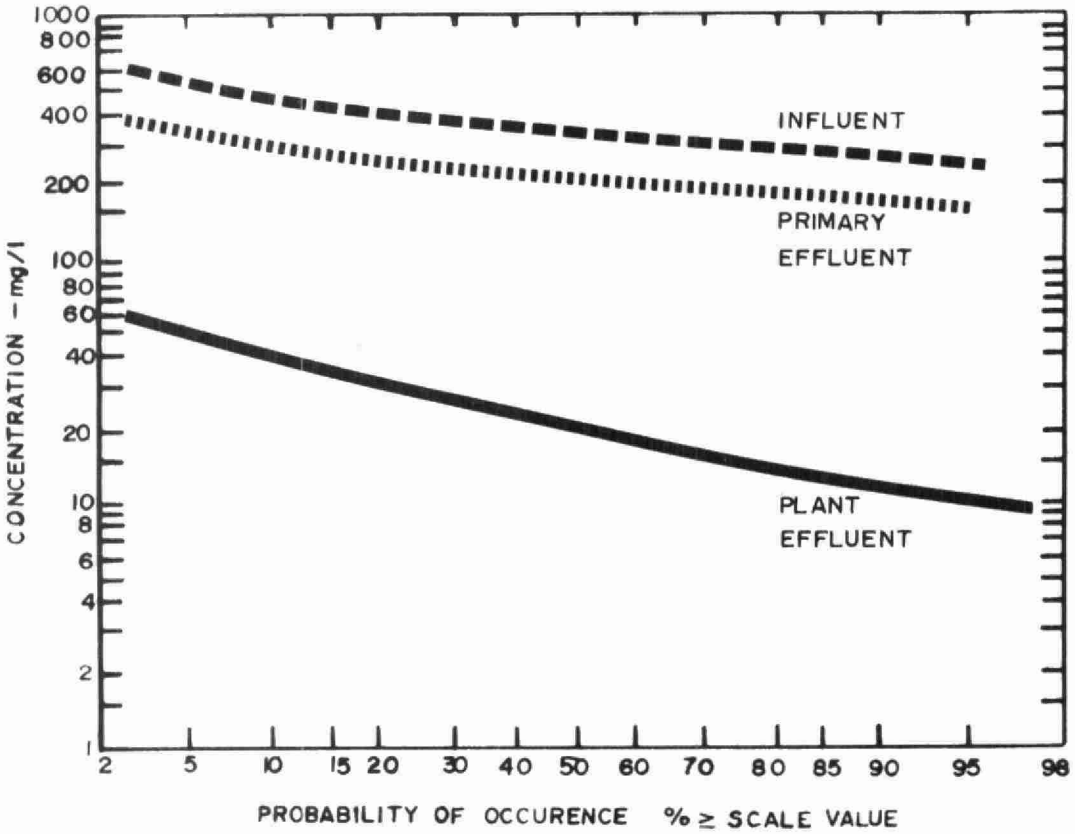
COMMENTS

An average chlorine dosage rate of 4.8 mg/l was required to maintain a chlorine residual of 0.5 mg/l in the final effluent.

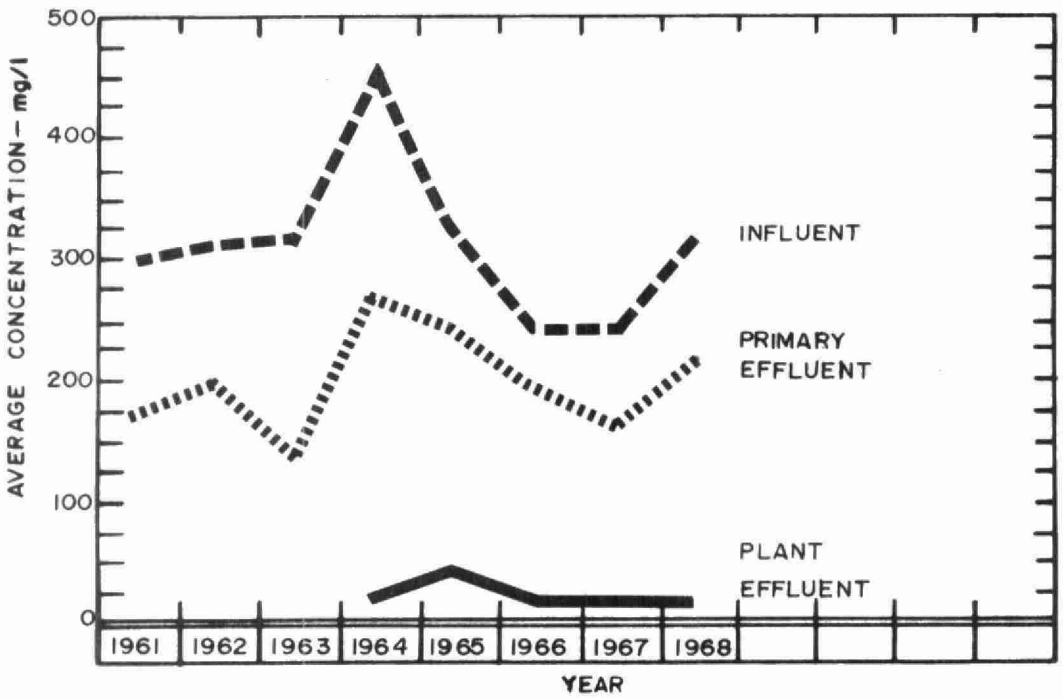

20
15
10
5
0
FLOW - mgd
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

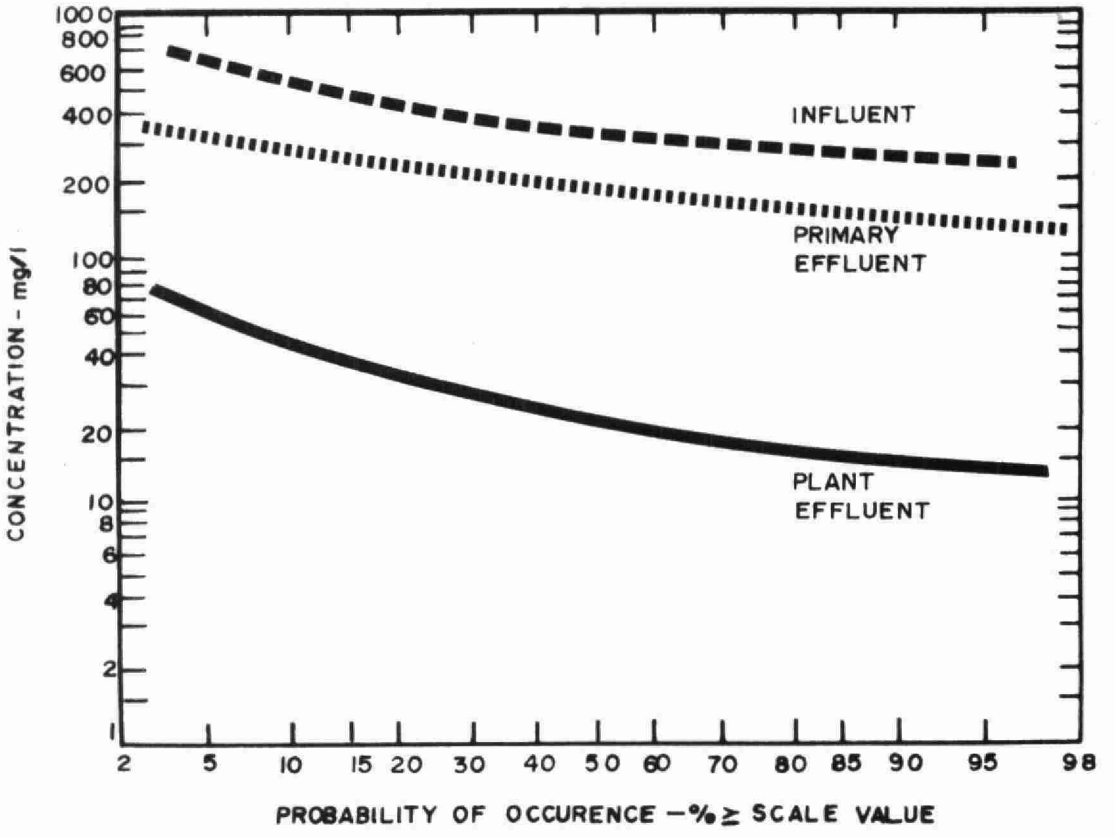
FLOWS


20
15
10
5
0
AVERAGE FLOW - mgd
DESIGN CAPACITY 13.5 MGD
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

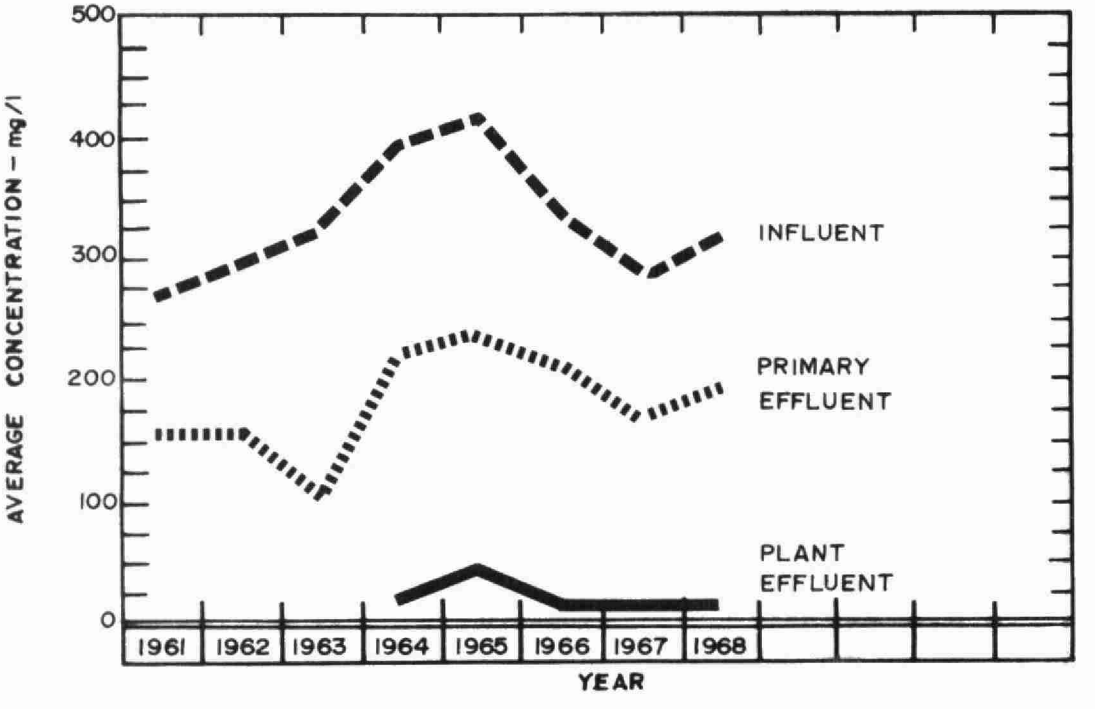


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT
	INF CONC^N mg/l	EFF CONC^N mg/l	RED^N %	REMOVAL 10^5 lb	INF CONC^N mg/l	EFF CONC^N mg/l	RED^N %	REMOVAL 10^5 lb	REMOVAL ft^3
JAN	308	19	94	9.38	302	17	94	9.25	819
FEB	277	24	91	8.31	324	19	94	10.01	777
MAR	283	15	95	9.12	223	12	95	7.18	642
APR	261	13	95	6.62	261	17	94	6.51	539
MAY	340	14	96	10.00	317	12	96	9.35	609
JUN	256	13	95	7.68	311	15	95	9.36	625
JULY	327	16	95	8.51	316	15	95	8.23	833
AUG	312	21	93	8.39	321	13	96	8.88	1062
SEPT	293	13	96	8.39	328	19	94	9.26	847
OCT	350	56	84	8.95	356	61	83	8.98	763
NOV	395	19	95	11.06	382	28	93	10.41	553
DEC	384	15	96	11.25	364	27	92	10.27	455
TOTAL	-	-	-	107.66	-	-	-	107.69	8524
AVERAGE	310	20	94	8.97	317	21	93	8.97	710

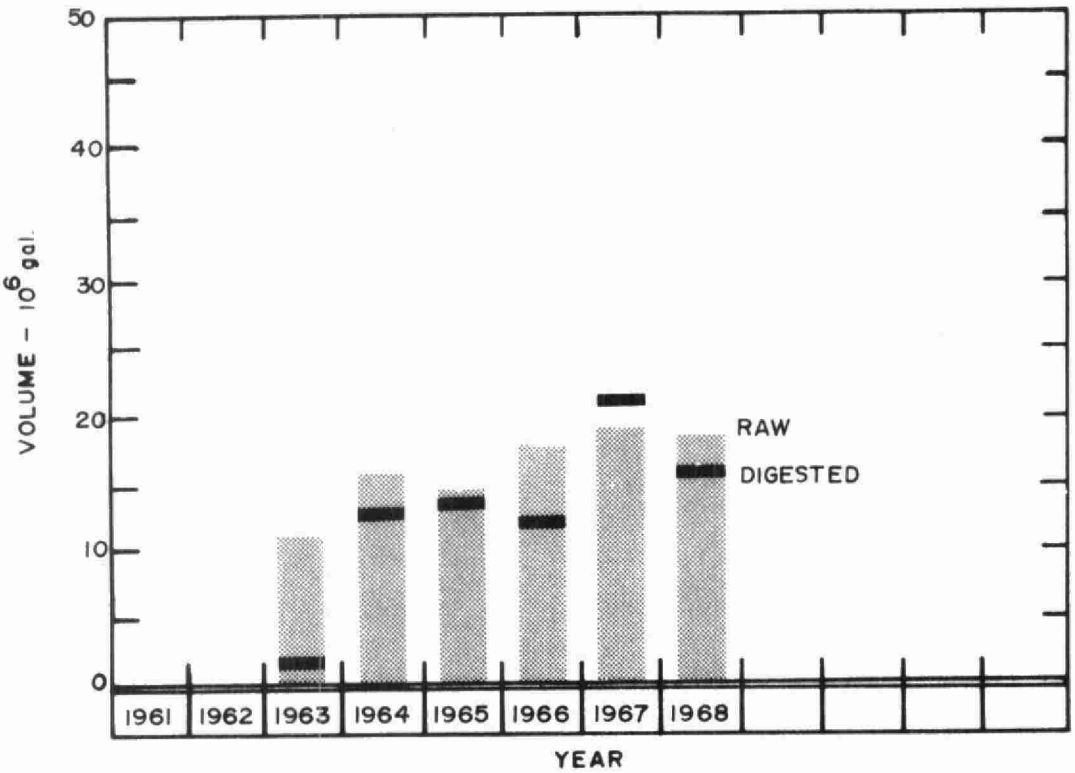
COMMENTS

The average raw sewage BOD of 310 mg/l was 3.3 percent greater than the design value of 300 mg/l. The raw sewage design value was exceeded 70 percent of the time. The average effluent BOD was 20 mg/l. The OWRC effluent BOD objective of 15 mg/l was exceeded 75 percent of the time. However, the average BOD removal efficiency was 96.6 percent.

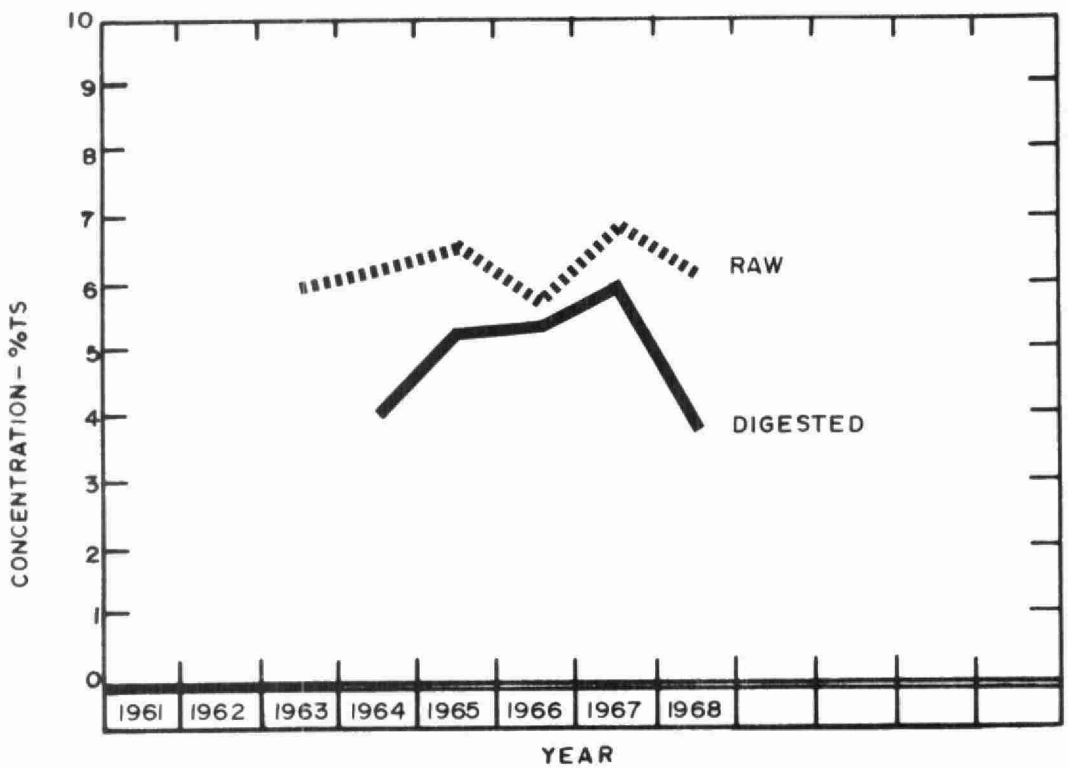
The average raw sewage suspended solids concentration of 317 mg/l represents 70.5 percent of the design value of 450 mg/l. The raw sewage design value was exceeded 15 percent of the time. The average effluent suspended solids was 21 mg/l. The OWRC effluent suspended solids objective of 15 mg/l was exceeded 87 percent of the time. However, as with the average BOD removal efficiency, the average suspended solids removal efficiency of 93.5 percent was very good.

A total of 5383 tons of BOD and 5383 tons of suspended solids were removed in 1968.

The average raw sewage BOD and suspended solids concentrations exceeded the 1967 average values by 29.2 percent and 11.2 percent respectively. This resulted from an average decrease in flow of 5.4 percent as compared to 1967. Consequently, the raw sewage was more organically concentrated.


50
40
30
20
10
0
VOLUME - 10^6 gal.
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

DIGESTION


10
9
8
7
6
5
4
3
2
1
0
CONCENTRATION - %TS
RAW
DIGESTED
1961
1962
1963
1964
1965
1966
1967
1968
YEAR

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10^6 gal	T. S. %	V.S. %	VOLUME 10^6 gal	T. S. %	V.S. %	VOLUME 10^6 gal	T. S. %	LIQUID yd^3	DEWATERED yd^3
JAN	1.71	6.0	72	1.59	4.1	51	.45	-	5343	1074
FEB	1.43	6.5	75	1.49	3.8	56	.15	-	8684	5
MAR	1.49	5.0	70	1.03	3.6	56	.23	-	6071	0
APR	1.60	5.9	73	1.50	4.0	56	.23	-	8500	0
MAY	1.68	6.5	70	1.26	4.0	57	.37	-	7462	0
JUN	1.50	6.5	73	1.26	4.0	58	.44	2.4	7095	0
JUL	1.26	5.8	74	1.48	3.8	56	.01	-	8736	0
AUG	1.41	6.4	63	1.14	4.3	55	.18	-	6737	0
SEPT	1.58	6.3	67	1.31	4.4	53	.28	-	7737	0
OCT	1.76	7.0	77	1.46	3.8	53	.23	-	8678	0
NOV	1.34	6.0	72	.88	3.3	58	.48	-	5212	0
DEC	1.56	6.6	78	0.78	3.7	60	.80	-	4600	0
TOTAL	18.32	-	-	16.18	-	-	3.85	-	84855	1079
AVERAGE	1.53	6.2	72	1.27	3.9	56	.32	2.4	7071	-

COMMENTS

An average of 1.53 million gallons of sludge per month was pumped to the primary digesters. The raw sludge averaged 6.2 percent total solids of which 72 percent was volatile matter.

Digested sludge from the secondary digesters averaged 3.9 percent total solids of which 56 percent was volatile matter. The average reduction in volatile matter was 50.5 percent. This compared favourably with existing comparative criteria.

AERATION

MONTH	AVERAGE FLOW mgd	PRIMARY EFF		SECONDARY EFF		ML SS CONC^N mg/l	F/M $\left(\frac{\text{lb BOD}}{\text{lb MLSS}}\right)$	AIR USED $\left(\frac{1000\ ft^3}{\text{lb BOD REMOVED}}\right)$	WASTE SLUDGE 10^5 lb
		BOD CONC^N mg/l	SS CONC^N mg/l	BOD CONC^N mg/l	SS CONC^N mg/l				
JAN	10.47	206	197	19	17	2,540	.23	-	5.29
FEB	11.32	221	189	24	19	2,430	.26	-	4.60
MAR	10.98	195	163	15	12	2,700	.20	-	3.84
APRIL	8.90	192	157	13	17	3,120	.14	-	3.46
MAY	9.89	201	189	14	12	3,040	.17		4.22
JUN	10.54	190	309	13	15	2,590	.20		5.04
JUL	8.82	214	156	16	15	2,240	.21	-	2.85
AUG	9.30	177	131	21	13	2,600	.16	-	2.98
SEPT	9.99	201	166	13	19	3,000	.36	-	4.27
OCT	9.82	224	216	56	61	2,400	.23	-	4.86
NOV	9.80	303	227	19	28	2,500	.30	-	3.86
DEC	9.83	247	221	15	27	2,300	.27	-	2.67
TOTAL	-	-	-	-	-	-	-	-	47.94
AVERAGE	9.96	214	193	19	21	2,620	.23	-	4.00

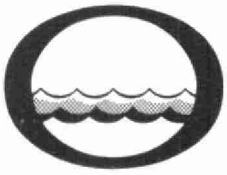
COMMENTS

The average primary effluent BOD and suspended solids concentrations were 214 mg/l and 193 mg/l respectively. The primary clarifier average BOD and suspended solids reduction efficiencies were 31.0 percent and 29.3 percent respectively.

The average MLSS concentration of 2620 mg/l and F/M ratio of 0.23 are within the accepted limits of good aeration tank operation.

CONCLUSIONS

Consideration to expansion or renovation of the primary clarifiers should be given in the next year or two, especially if flows continue to increase at the present rate.



Water management in Ontario